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USSR MACHINE TOOLS AND LIQUID-ABRASIVE PROCESS

MODEL 6792 SEMIAUTOMATIC FOR MILLING DRILL FLUTES -- Moscow, Stanki i Instrument, Feb 51

The /Leningrad/ Automatics Plant has perfected and put into series production Model 6792 semiautomatic machine tool for the tool industry.

Flutes of drills can be milled on the new semiautomatic with various angles of spiral within the range of 20 to 30 degrees. Thus these drills can be used in high-speed operations. In addition, Model 6792 is making it possible to mill long drills. Hence the variety of types of drills manufactured is being broadened.

The new machine tool can mill flutes on drills from 15 to 25 millimeters in diameter. Two opposite flutes are milled with the use of a fluting form-milling cutter and the lip reliefs are machined with a form-milling cutter. This process is accomplished in two operations. One flute and one lip relief are milled first, and then the blank turns 180 degrees and the same operations take place on the opposite side. All movements except inserting and removing the drill are automatic. One worker can attend 15-20 machine tools.

The main electric motor, AD22-4, has a power of 1.5 kilowatts and a speed of 1,440 revolutions per minute.

The spindle of the relief-milling head has a speed of 300 revolutions per minute, and the spindle of the fluting milling head has a speed of 160 revolutions per minute.

A flange-type electric motor, ADF 21/4, which drives the spindle, has a power of one kilowatt and a speed of 1,420 revolutions per minute.

/Photograph and schematic drawings of Model 6792 semiautomatic, not reproduced herein, are available in source./

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RNSh-2 THREAD-ROLLING MACHINE TOOL -- Moscow, Stanki i Instrument, Mar 51

The rolling of threads on various parts has become a common technological process. The wider dissemination of this progressive method is limited by the [small] number of machine tools being produced and their [low] power. As a rule, machine tools being manufactured are designed for rolling threads up to 36 millimeters in diameter and with a pitch of up to 3 millimeters. To further expand the field of applying the thread-rolling method, an experimental high-power thread-rolling machine tool, RNSh-2, has been designed and manufactured for rolling coarse trapezoidal threads.

This experimental machine tool is considerably more rigid and more powerful than other existing machines. It is designed for rolling, with two rollers, trapezoidal and metric threads from 6.0 to 80 millimeters in diameter, with a pitch of up to 6 millimeters, and 150 millimeters long (without axial feed of the part); also for rolling the same type of threads on thread-rolling rollers up to 160 millimeters in diameter with the use of a master screw.

Each metalworking plant can manufacture for its own use one or two such machine tools in its machinery and repair shop by using lathes that have been written off as obsolete in design.

Model RNSh-2 is equipped with a 7.5 kilowatt electric motor which has a speed of 960 revolutions per minute.

The gear box installed in the machine tool makes it possible for the rollers to attain a speed of from 15 to 350 revolutions per minute.

The maximum consumption of compressed air in threading 1,000 parts is 3-4 cubic meters at a pressure of 5 kilograms per square centimeter.

[Photograph and schematic drawings of Model RNSh-2, not reproduced herein, are available in source.]

MODEL 7590 SLOT-BROACHING AUTOMATIC -- Moscow, Stanki i Instrument, Apr 51

Model 7590 slot-broaching automatic is intended for cutting slots in screw heads.

The automatic is continuous in operation. It has six broaching speeds, from 2.8 to 9 meters per minute. The maximum permissible circumferential force on the driving gear is 1,100 kilograms.

The maximum broaching length is 432 millimeters.

The machine tool is equipped with two electric motors. The main drive has a power of 2.7 kilowatts and a speed of 960 revolutions per minute; the auxiliary drive has a power of one kilowatt and a speed of 1,425 revolutions per minute.

The automatic has two set[illegible]s, one for screws from M3 to M6 and the other for screws from M6 to M10.

The range in diameter of items processed is from M3 to M10 and in length from 6 to 120 millimeters.

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The auxiliary electric motor, mounted on the hydraulic panel, drives two pumps, a rotary pump operating at a pressure of up to 30 atmospheres, which feeds the hydraulic system, and a gear pump at a pressure of one to two atmospheres, which feeds emulsion to the broach for cooling and washing the chips from it.

At present, milling machines with hand feed, automatics of the Conventry type, and two-spindle double-operating automatics of the Malmedy type are being used in industry for slotting screws. On an average, the maximum productivity of these machine tools is 20 items per minute. With a 75 percent utilization of machine tools, 7,200 items can be processed per shift and 2,100,000 items per year.

The average productivity of Model 7590 automatic at a broaching speed of 7.2 meters per minute is 218 items per minute. With the coefficient of utilization of machine tool operation calculated at 0.75 per shift, the average productivity is 79,000 items per shift and 23,200,000 items per year (working one shift). The productivity of Model 7590 is ten times as great as that of those described above.

The saving in cutting tools with the introduction of Model 7590 machine tool, can be seen from the following data: broaches have sufficient durability to slot 20,000-30,000 screw heads; milling cutters, only 2,500-3,000.

/Photograph and schematic drawings of Model 7590, not reproduced herein, are available in source./

1950 PRIZE-WINNING MACHINE TOOLS -- Moscow, Stanki i Instrument, May 51

In the sphere of automatizing the production process, the work in developing the Model MK-54 machine tool deserves attention. Designers at the Moscow Krasnyy Proletariy Plant, under the leadership of B. M. Pribryukov, designed and released in 1950 a special two-spindle semiautomatic lathe for the machining of a curvilinear (volumetrical) contour of an object by means of a volumetrical master form. The design of the machine tool takes into account all the demands made upon machine tools in socialist industry.

The automatic work cycle of the machine tool, the increased rigidity of its units, the practical arrangement of its units and of the control members, the mechanized fastening of the workpiece, etc., have increased the productivity of a worker more than six times. The vertical position of the spindles and other units has decreased the dimensions of the machine tool and reduced the area it occupies. Hand operations in profile finishing were completely eliminated, the number of workers engaged in any given operation was decreased, the power required for a unit of output was decreased by 40 percent, and a significant area of production space was freed. A number of Model MK-54 machine tools are now operating successfully in plants.

Models GF-49 and GF-50 machine tools, installed in a new stone-processing plant, can perform such operations as making profiles on stone, copying, processing radius parts, longitudinal and transverse grinding and polishing of shaped parts, profiling of radial door and pedestal cornices, manufacturing circular rosettes, and a whole series of other operations which had heretofore been done by hand. /Photograph of a section of the stone-processing machine-tool line, not reproduced herein, is available in source./

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Models VSh-3, VSh-4, and VSh-5 machine tools, built into a constant-flow line for processing the surfaces of facing slabs, have increased productivity in these work-consuming operations ten to fifteen times, and have created the possibility of the intricate manufacture of facing slabs from granite, marble, and limestone.

The high degree of accuracy and finish of the process has made it possible to shorten the time required for polishing parts, and in some cases to eliminate it completely.

In the planning of the machines indicated, a number of complicated problems were solved, such as the development of original stone-processing tools (planetary grinders), which ensure high productivity and a /good/ surface finish on the stone, a selection of methods of stone processing; and the development of original hydraulic devices with elongated cylinders, which permit wide adjustment of feed limits.

In the period 1947 - 1950, the Leningrad Plant imeni Sverdlov developed original universal horizontal boring machines. Models 262G, 262D, 2621, 2625, and 2626 were produced.

/Information on Models 262G, 262D, and 2621 is available in FDD Translation No 301, 25 Apr 1951./ Models 2625 and 2626 are equipped with an optical projection device for observing the setup according to coordinates which, through hundredfold magnification, ensures the accuracy of readings to 0.01 millimeter.

In 1950, the plant designed and manufactured high-speed boring machines, Models 2631, 2632, 2633, and 2634.

The speed of the boring spindle on these machine tools reaches up to 1,500 revolutions per minute. They are equipped with an optical projection device for the verification of the coaxiality and parallelism of the axis of the bushing of the end support on the movable column with the axis of the boring spindle (Model 2633), and with an optical projection device for observing the setup according to coordinates (Model 2634).

The plant, during 1949 - 1950, also developed a number of models of high-duty special machine tools, which embody the principles of the basic models 262 and 2361 /sic; 2631?/, (LR-6, LR-9, LR-21, and LR-24).

In 1949, a unique, four-spindle, high-speed machine tool, Model LR-10, for the boring of locomotive cylinders was developed and released. The machine is provided with automatic electrical controls.

With the introduction of the Model LR-10 machine tool into production in 1950, labor productivity in the boring of locomotive cylinders increased five times.

Other technical characteristics of the released high-speed boring machines are the utilization of electric drive with a wide range of change in the amount of feed within the limit of 1:600; the introduction of electromechanical selective and preselective devices for shifting spindle speeds by means of a single-lever control; and the introduction of special automatic reading devices, as well as optical devices for observation of readings.

The work which ensured the wide introduction of high-speed cutting (the development of high-speed machine tools and tools for high-speed cutting), and the high indexes of high-speed cutting achieved by production workers were also recognized by Stalin Prizes for 1950.

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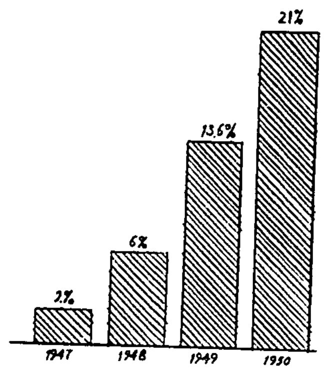
The following graph shows the output of hard-alloy cutting tools produced by plants of the Main Administration for Tool Production of the Ministry of Machine Tool Building, in percentages of total output of cutting tools.



MULTITOOL COPYING SEMIAUTOMATIC -- Moscow, Stanki i Instrument, Jun 51

Model 18K2 semiautomatic has been manufactured on the basis of Model 118B multitool semiautomatic with slight design changes in corporating a new principle, the simultaneous copying of a spherical surface and turning of tapers up to 45 degrees, with a diameter of up to 300 millimeters.

The development of this new principle has made it possible to reduce to one third the required quantity of multitool semiautomatics for copying complex shaped items, and to increase their productivity to a maximum.

To perform the operations involved, as shown in Figures 1, 2, and 3, three special machine tools were required. Now, all three operations can be performed on one machine tool, Model 18K2. This machine tool was developed by Aleksey Vasil'yevich Korenkov, leading designer; and Yevgeniy Filippovich Sokolov and Viktor Petrovich Kulikov, designers.

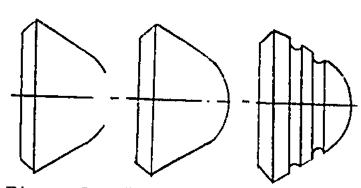


Figure 1 Figure 2 Figure 3

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MODEL 6654 PLANO-MILLING MACHINE -- Moscow, Stanki i Instrument, Sep 51

/A photograph of Model 6654 plano-milling machine, not reproduced herein, is available in source./ The size of the table is 1,250 by 8,500 millimeters; longitudinal table travel is 8,200 millimeters; maximum work height, 1,250 millimeters; range of stepless table feeds, 12 to 900 millimeters per minute; power of electric motor for milling heads, 22 kilowatts; power of electric motor for feed, 10 kilowatts; weight of machine tool, 76,000 kilograms. It was designed by M. P. Kim, leading designer, and Yu. D. Vragov, chief designer.

MODEL 1240-6 SIX-SPINDLE AUTOMATIC LATHE -- Moscow, Stanki i Instrument, Oct 51

/A photograph of Model 1240-6 six-spindle automatic lathe, not reproduced herein, is available in source./ Parts can be machined on this lathe from bar stock up to 40 millimeters in diameter. The maximum bar feed is 200 millimeters; range of speeds of each spindle, 158-2,170 revolutions per minute; power of main electric motor, 20 kilowatts; weight of machine tool, 9,500 kilograms; dimensions, 5,810 x 1,400 x 2,055 millimeters. It was designed by Ivan Aleksandrovich Rostovtsev, chief designer, and Yakov Pavlovich Zel'man leading designer.

MODEL 5717 GEAR SHAVING MACHINE -- Moscow, Stanki i Instrument, Nov 51

/A photograph of Model 5717 gear shaving machine, not reproduced herein, is available in source./ It is intended for shaving external spur gears from 200 to 1,250 millimeters in diameter (m = 2-8 millimeters) and for internal gears up to 600 millimeters in diameter. The length of the gear tooth that can be shaved is from 15 to 200 millimeters. The power of the main electric motor is 4.5 kilowatts; dimensions of the machine tool, 3,083 x 1,650 x 2,080 millimeters; weight of machine tool, 7.5 tons. It was designed by S. A. Mosolov, chief designer, A. A. Yevdak, leading designer, and B. M. Blinov, leading technologist.

MODEL 3110 UNIVERSAL CYLINDRICAL GRINDING MACHINE -- Moscow, Stanki i Instrument, Dec 51

/A photograph of Model 3110 universal cylindrical grinding machine, not reproduced herein, is available in source./ The maximum workpiece diameter is 100 millimeters; maximum workpiece length, 200 millimeters; recommended workpiece diameters, from 3 to 20 millimeters; maximum length of external grinding, 200 millimeters; internal grinding, 50 millimeters; total power of electric motors, 2 kilowatts; weight of machine tool, 850 kilograms; dimensions of machine tool, 1,000 x 800 millimeters. It was designed by Boris Timofeyevich Bre[illegible]ev, chief designer, and Mikhail Savel'yevich Khitruk, leading designer.

LIQUID-ABRASIVE PROCESSING -- Moscow, Stanki i Instrument, Jul 51

Experimental work has been conducted at the Automobile Plant imeni Stalin on liquid-abrasive processing of parts. V. I. Sergeyev, A. F. Bulychev, V. S. Zemskova, and M. P. Panasenkova participated in the research work.

The unit for conducting the experiments consists of a small working chamber for directing the abrasive liquid to the workpiece, and a tank with the abrasive liquid.

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/A detailed description of the experiment, sketches, graphs and photographs, not reproduced herein, are available in source./

On the basis of the research carried out, the following conclusions can be made:

1. One of the basic factors on which the effectiveness of the liquid-abrasive process depends is the conversion of the potential energy of compressed air to kinetic energy of the jet in the jet apparatus. Not only the kinetic energy of the jet but also the speed which is acquired by the abrasive particles, are of extremely great importance.

2. The kinetic energy of the jet of the abrasive liquid and the speed which is acquired by the abrasive particles, in addition to the pressure and quantity of compressed air conducted to the jet apparatus, depend on the design and size of the jet apparatus.

3. The jet of abrasive liquid emitted from the jet apparatus has a relatively high cutting property. Thus, for example, when the jet of air which is emitted through a cylindrical nozzle 5.8 millimeters in diameter with an air pressure of 5.5 atmospheres, combines with the liquid containing the abrasive M5, it can hollow out a hole 1.5 millimeters deep and remove 0.5 grams of metal in 5 minutes. The same jet of abrasive liquid can also produce a surface roughness to a root mean square height of 3 microns.

4. With liquid-abrasive processing, up to the 10th class of finish according to GOST 2789-45 can be achieved, and an equal amount of metal can be removed from all parts of the surface.

5. A slit nozzle with a cross section corresponding to the contour of the workpiece, in a direction perpendicular to the movement of the jet apparatus, must be used to insure an even surface finish.

6. The experiments which have been conducted do not establish a basis for the assumption that the application of liquid-abrasive processing will increase the productivity of final machining as compared with known methods such as finishing with abrasive stones, mechanical polishing with an abrasive belt, etc. However, it is unconditionally effective in processing complex shapes or surfaces which are not easily accessible.

7. The effectiveness of using liquid-abrasive processing in each concrete case can be checked on a simple experimental unit. -- N. I. Gorayetskiy

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